Briefing Paper

Regarding the

**Final Report of Data From the
Study of the Sharkey Soils
in the Lower Mississippi Valley**

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Background

The study was conducted in response to the 1999 Senate Agricultural Appropriations Subcommittee directive to NRCS to “establish a pilot project to clarify and conclusively determine the proper classification and taxonomic characteristics of Sharkey.” The final report on the Sharkey Soils of the Lower Mississippi Delta, presented to the Chief, NRCS, December 2006, represents the conclusion of a sampling and monitoring project conducted on two sites in Mississippi.

Summary of Main Points from the Study Report

The results from this study do not allow us to conclusively answer all of the relevant questions about Sharkey soils, but they do help us to better understand the nature of Sharkey soils and to focus our future activities. Several factors that limit the interpretation of the data are as follows:

1. The original study proposal was for at least six sites in four states. They were to include both altered (drained and farmed) and unaltered (natural) sites and were to cover a variety of landscape positions. Because of budget constraints, described in a letter to the Delta Council in January 2000, monitoring had to be cut back to just two sites in Mississippi. Both sites were farmed and had altered hydrology. It was known at the time that areas mapped as Sharkey contained a subtle landscape complexity consisting of slightly convex highs; linear, nearly level flats; and concave lows. The monitored sites were both on the nearly level flats (middle landscape position).
2. Piezometers were installed to monitor free water levels. We learned that they simply do not work well in soils with such a high clay content. We suspect that water recorded by the data loggers may have been the result of water flowing through macropores, rather than truly saturating the soil. So, although water was observed by the monitoring equipment, we are reluctant to conclude that the soil was truly saturated at all of those times.
3. Platinum electrodes were installed to verify that reducing conditions occurred. An independent check of the sensors at the end of the study indicated that most of the electrodes were defective. Thus, the data obtained from the sensors are not reliable.
4. Annual precipitation during the study period tended to be either significantly higher or lower than the statistically determined “normal” from long-term records. This deviation increases the difficulty of drawing conclusions about the hydrology of the soil.

4. As a result of this study, as well as the earlier field study conducted in 1996 and presented to the Soil Survey Division Director in 1997, and despite the problems noted above, we have in fact improved our understanding of the Sharkey soils. The following conclusions can be drawn:

wetting from below, but this was of limited extent. The lack of saturation from below may be the result of the altered hydrology in the region, which we did not fully appreciate before this study.

3. This study adds to our knowledge of the length of time required for anaerobic conditions to develop once the soil becomes ponded. A few of the results with alpha alpha Dipyridyl dye showed that reducing conditions occurred within about 10 days of the onset of ponding. This finding gives us a clue as to the approximate duration of ponding needed to produce anaerobic conditions in the surface layer of these soils.
4. The two sites monitored in this study were not “proven to meet the hydric soil technical standard.” Two factors lead to this conclusion. First, because of the unfortunate limitations described in the first part of this summary, we simply have little reliable measured data from the piezometers and platinum electrodes upon which to draw. Secondly, the study sites are being farmed and have had their hydrology altered by common surface water management practices in the area. We recognize altered soils as hydric if we can reasonably demonstrate that saturation and reduction were major processes occurring in the soils before the alteration. Soil scientists have determined that characteristic features remain in the soils after alteration. These features, which are described in the publication *Field Indicators of Hydric Soils in the United States* (2006), are used by wetland scientists to identify hydric soils in the field. Both NRCS and the USACE use this document in wetland delineation work as a matter of policy. Both of the soils described in this study have hydric soil morphology, as described in this publication (indicators F3 and A11). More than half of the 14 sites observed in the field in the previous Sharkey study (reported in 1997) also have hydric soil morphology. This is not to say that all areas mapped as Sharkey today are hydric. We know that there are included areas of nonhydric soils, especially in the slightly higher convex positions. So, a soil that meets the saturation and reduction criteria today or that can be shown (by the field indicators) to have formed under those conditions prior to alteration, is a hydric soil. This is not the same, however, as saying it is a wetland today. Many areas of altered hydric soils are treated as “prior converted” or “farmed wetlands” for USDA program purposes. In addition, recognizing a soil as hydric, even after alteration, is very important in implementing USDA wetland restoration programs. A criteria for program participation is the presence of a hydric soil on the site to be restored.

Future Activities

Given our current understanding as gained from the activities carried out since 1996, when NRCS was first directed to investigate the Sharkey series, there are several key things we plan to do as we move forward with soil survey in the region.

1. We will use the new MLRA approach, under the leadership of the MLRA Region Offices, to focus on improving the quality of our work in areas currently mapped as Sharkey (and similar) soils. We know that the landscape in these areas has a subtle complexity. We are working with NGDC in West Virginia to develop a pilot test project using new 3-D landscape modeling tools (such as LIDAR and IFSAR). If successful, this project will greatly improve our ability to accurately separate soils in convex, linear, and concave positions. For example, where appropriate, we will separate areas of nonhydric soils, such as Openlake soils, in convex positions, and the hydric Dowling soils in concave positions. Sharkey soils will continue to be recognized on the linear flats.
2. While continuing to recognize Sharkey as a hydric soil, we will make greater use of map unit phases, such as “protected,” “drained,” and “frequently flooded,” to better depict the alteration (or lack of alteration) of hydrology. Use of these phases should be beneficial to the USDA Service Center staffs in program implementation.
3. We now know that future monitoring efforts should be focused on the upper 6 to 12 inches of the soil and that piezometers and platinum electrodes are not preferred. We will instead utilize the simpler, more reliable new IRIS tube technology to document the presence of reduction in the soil and staff gauges to record the depth and duration of ponding.

4. We will provide training to field soil scientists so that they will be better able to design and carry out field studies of water tables. This training will be integrated into the Soil Geomorphology Institute classes to be held each of the next four years. We will also develop a technical note describing instrumentation procedures in time for the NCSS conference in June 2007.
5. We will request that the National Technical Committee for Hydric Soils consider accepting a charge to refine the definition of “saturation” as it applies to soils with a very high clay content.

Summary

The Sharkey study report summarizes data obtained from two sites in Mississippi to document hydric soil characteristics. Although several unfortunate problems limit our ability to draw clear conclusions from the data, this study, as well as the previous field study in 1997, has improved our understanding. We know that previously mapped broad areas of Sharkey soils include intermingled nonhydric soils that are predictable with respect to their position on the landscape. We are proposing to test new 3-D modeling tools as part of our MLRA update process to separate soils in convex, linear, and concave landscape positions. We also propose increased use of map unit phases to help distinguish areas of hydric soils with altered hydrology from more natural areas.

We know that the wetness characteristics of Sharkey soils result primarily from surface ponding. Results suggest that about 10 days of ponding may be sufficient to induce anaerobic conditions. Future monitoring will include use of IRIS tubes and staff gauges in an effort to focus attention on hydrology and reducing conditions in the upper part of the soils.

The soils on the two sites in this study have been drained because of surface water management practices. Their morphology is consistent with that of a hydric soil, as described in *Field Indicators of Hydric Soils of the United States*. These are hydric soils, but for program purposes are they treated as “prior converted” or “farmed wetlands.”

We will provide training to our field personnel to improve their skill in monitoring soil wetness. This training will be through a technical note and in the classroom at the Soil Geomorphology Institute.

We are requesting that the National Technical Committee for Hydric Soils consider refining the definition of “saturation” in soils with a very high clay content.